Dr. John N. Kraeuter
Associate Director
Haskin Shellfish Research Laboratory
Institute of Marine and Coastal Sciences
Rutgers University

Written Testimony
Before the Committee on Resources
United States House of Representatives

Hearing on the Status of the Eastern Oyster (*Crassostrea virginica*) and the Petition to List the Eastern Oyster as Endangered or Threatened under the Endangered Species Act

July 19, 2005

Mr. Chairman, members of the Committee. I am Dr. John Kraeuter, Associate Director of the Haskin Shellfish Research Laboratory, Institute of Marine and Coastal Sciences, Rutgers University. I am here today to provide testimony on the status of the Eastern Oyster and the Petition to List the Eastern Oyster as Endangered and Threatened.

My Cirruculum Vitae is appended to the disclosure document.

This is document supports my testimony before your committee.

I have polled my academic colleagues, who I think are familiar with the biology, ecology and status of *Crassostrea virginica,* on their opinion about listing it as Endangered and Threatened. I purposefully did not contact the many state and federal biologists, or industry members with advanced degrees to avoid potential for conflict of interest. Within this list are three individuals who were on the National Academy of Sciences Panel that produced the volume on Nonnative Oysters in the Chesapeake Bay, and one who has served on the National Academy Review of Endangered Species. Of the 17 I was able to contact, not one individual thought that listing the eastern oyster as endangered or threatened was scientifically justified, many thought it would hinder restoration efforts. Some voiced the opinion that while disease and habitat destruction were issues relative to the oysters abundance they do not fundamentally affect the potential for extinction of the species. These experts thought the most important factor was that local managers in some areas have not managed the resource in a way that the oyster population and the oyster habitat was maintained. The problem is not one of biology, but of the interactions between science, management and the political process.

My professional opinion is the same: There is no scientific justification for listing the eastern oyster, *Crassostrea virginica* as endangered or threatened. Furthermore such a listing would hurt existing efforts on habitat restoration for this species by placing unneeded and unnecessary bureaucratic hurdles in the way. In addition these hurdles would greatly hinder other efforts to restore our estuaries, again by placing bureaucratic hurdles where they will simply deter rather than enhance. Quite simply we need a management strategy system that provides long term population goals, quantifiable data on the status of the resource, AND the will to implement the means of achieving the goals based on the data.

That said, there are a number of important societal, and ecological reasons for having large populations of filter feeders (oysters, clams, scallops, mussels etc.) in our nearshore systems:

Filter feeders assist in maintaining water quality by removing both phytoplankton and other suspended materials from the water and depositing it on the bottom. This can augment in nutrient recycling, and improve water quality, at least locally;

Filter feeders support recreational, and commercial (fishing and aquaculture) activities thus connecting our increasingly urban population to the natural system. By doing so shellfish are ready made ambassadors for good water quality (you can swim in water that is microbiologically unsafe for shellfish harvest);

Reef forming filter feeders such as oysters provide a hard substrate in an area dominated by soft bottom (sand and mud) habitats. This hard substrate is essential for oyster recruitment and allows many other species to inhabit an otherwise uninhabitable area.

I'd like to now focus my attention on an area I am most familiar with, Delaware Bay.

In New Jersey the chief oyster producing area is Delaware Bay (Figure 1). Our laboratory has been active in oyster research in Delaware Bay since the early 1900's. Since the middle 1950's we have had an annual sampling program that assessed the natural oyster seed area in this estuary.

We have landing records that date from 1880, but we know that oyster harvest within the bay began much earlier (Figure 2). The system of moving oysters from the upper bay (seed beds) to the lower bay (planted grounds) was in place by the middle of the 1800's. Seed were exported from Delaware Bay to growing areas in Massachusetts and Connecticut in the early 1800's and imported into the system from at least 1829 (the opening of the Chesapeake and Delaware Canal. This practice was halted when the oyster disease MSX (*Haplosporidium nelsoni*) entered the bay and caused heavy mortality on the planted oysters. At least half of the drop in landings post MSX was due to the loss of imported seed and does not reflect changes in the natural oyster population or its production within the bay.

Our systematic records date from just before the incursion of MSX, but were initiated because of concern about the declining production before MSX. We have recently been working through the records (they were recorded as numbers of oysters per bushel of sample) and converting these to numbers of oysters per square meter. These data represent the most productive areas of the seed beds, and indicate (Figure 3) that oyster abundance was indeed low in the 1950's prior to MSX and remained low until the early 1960's when recruitment increased. Although MSX removed over 90% of the oysters in the lower bay planted grounds (probably half the NJ population) in 1957/58 there was no subsequent change in the abundance of spat (Figure 3). In the early 1960's increased spat set began a period of high abundance (in spite of the continued low levels of MSX) which lasted until the middle of the 1980's when another MSX epizootic (1985), associated with a severe drought, reduced the numbers of adult oysters in the system. This second outbreak, while causing widespread losses, seems to have yielded increased resistance to the introduced disease in the oyster population. There is some evidence that adult population began to recover (see slight increase in 1987 and 1988), but dermo (*Perkinsus marinus)* reached epizootic levels in 1990. The subsequent reduction in adult oysters in the lower portion of the seed beds (or some other factor (s)) appear to have set the oyster population at a lower level. There is reasonable evidence that the increase in dermo was due to the increase in water temperatures during the same period.

The net effect of the 1985 MSX, and the 1990's dermo induced mortalities is that we are now in a period of low abundance. The most recent decrease is due to the dermo coupled with 5 years of poor spat settlement. We are very concerned about this condition and have been reducing the allocation for harvest as this condition persists. In 2005 the allocation is about half that of 2004, and amounts to less than 1% of the marketable oysters on the seed beds.

In spite of the low abundance there are approximately 1.9 billion oysters on the seed bed area of the New Jersey side of Delaware Bay. Of these about 100 million oysters, 2.5 inches and greater, are present on the most productive parts of these beds. These figures do not include areas of the bay we do not sample, the oyster populations is tidal creeks

fringing the bay and the planted grounds down bay (Figure 1). There could easily be as many oysters outside the sampled area as in the sampled area.

The standing stock of oysters is only part of the story. What is equally important is the mortality rate and the recruitment rate. Contrary to general opinion, the eastern oyster is not well adapted to quick recoveries. The chart shows the record from Delaware Bay for the past 50 years (Figure 4). Note that even in the year of highest spat abundance the adults produced only approximately 3.5 spat per adult. The long term (50 year) average is only 0.79 spat per adult. This means that restoration efforts will require a concerted effort over a relatively long period of time.

In Delaware Bay we have embarked on a program to enhance the resource by a three pronged strategy: Reduced harvest, planting of shell to enhance recruitment on the seed beds, and planting of shell in areas of high spat set (Figure 4). It is often startling to people who haven't studied oysters in an area with a salinity gradient such as Delaware Bay, that the areas with the best recruitment of spat are not the best areas for survival. The seed beds are in an area where spat set and subsequent growth is modest, but survivorship is high. The areas of highest spat set are often areas of good growth, but poor survival. This is the genesis of using the seed bed as a source for oysters that were larger (seed) and could survive better in the higher salinity. The higher salinity areas in Delaware Bay also produces oysters with better meat quality. A pilot-scale shell planting in 2003 by the State of New Jersey showed that the setting rate on clean shell in areas of high settlement was 75 times greater than the natural rates on the seed beds. Current projections indicate that the $40,000 spent on this program should yield 20,000 to 40,000 bushels of marketable oysters in 2006. At current prices this is an ex-vessel value of $700,000 to $1,000,000, and at the current tax of $1.75 per bushel yield between $35,000 and $70,000 for the resource development account. We know the science of how to restore oyster populations. We should study these attempts to indicate how we can do oyster restoration more efficiently.

The enhancement program for 2005 to 2007 is being funded by $100,000 per year from the Federal Government through the empowerment zone, $150,000 from the Corps of Engineers, $100,000 per year from the State Government and a self imposed Tax on the commercial oyster industry. The latter currently has $178,000 in the account and it will be added to as oysters are harvested. We believe we have sufficient funds to continue it for 3 years. The program is designed to become self funding as the oysters from the enhancement effort are harvested they will provide greater landing-fee receipts (taxes) which can sustain the program.

While such a program sounds great, it is only for 3 years, and it took a number of dedicated individuals several years to secure funding. Even at the last minute there was an attempt to derail the program by suggesting that oyster shells could cause a contaminant problem, and that the organization handling the funding could be liable for their removal from the system. This is in spite of centuries of experience throughout the world using oyster shell to enhance settlement. The biology of how to do oyster restoration is well

In summary, the Delaware Bay oyster resource has experienced both a historical and a recent significant decline, but plans are being implemented to assist in its recovery and the recovery of commercial production.

In terms of the charge of this committee. I can find no scientific evidence that would support listing the eastern oyster *Crassostrea virginica* as an endangered or threatened species.

Are there estuaries and oyster populations that need immediate attention and restoration. Unequivocally yes.

Is there a need for concerted, scientifically designed, quantifiable, documented long term habitat and oyster restoration efforts at the federal, state and local levels? Yes.

Is there a need for improving the water quality in the estuaries? Yes.

Is there a need to support aquaculture of oysters and other filter feeders as part of the overall improvement of our estuarine systems? Yes.

All this said, I would caution the committee that oyster habitat restoration (clean shell on the bottom being a key feature), is a necessary precursor to other efforts. This is a long term effort and the federal system can help by providing consistent long term (on the order of a decade or more) support. Please resist the temptation to provide large infusions of support for short periods, because experience suggest such efforts are less likely to succeed.

We also need a mechanism to move forward with time tested (although often not well documented) restoration efforts with species native to the area without wasting time (and therefore money) jumping through needless "environmental impact statements" just to be sure everyone can place the blame elsewhere.

Thank you for your time, and I'd be happy to answer and questions you may have now, or follow up on any of the materials I have submitted.

Delaware Bay Oyster Seed Beds

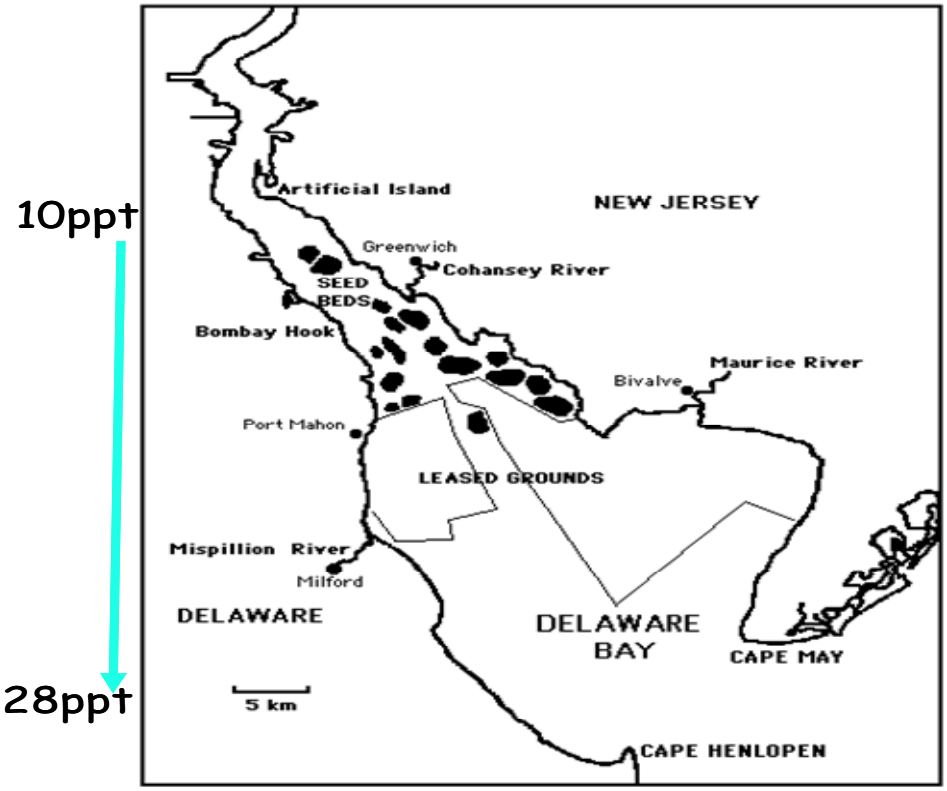

Figure 1. Delaware Bay Oyster Seed Beds. The arrow on the left of the chart indicates the approximate long term salinity gradient within the system (Source, Dr. Susan Ford)

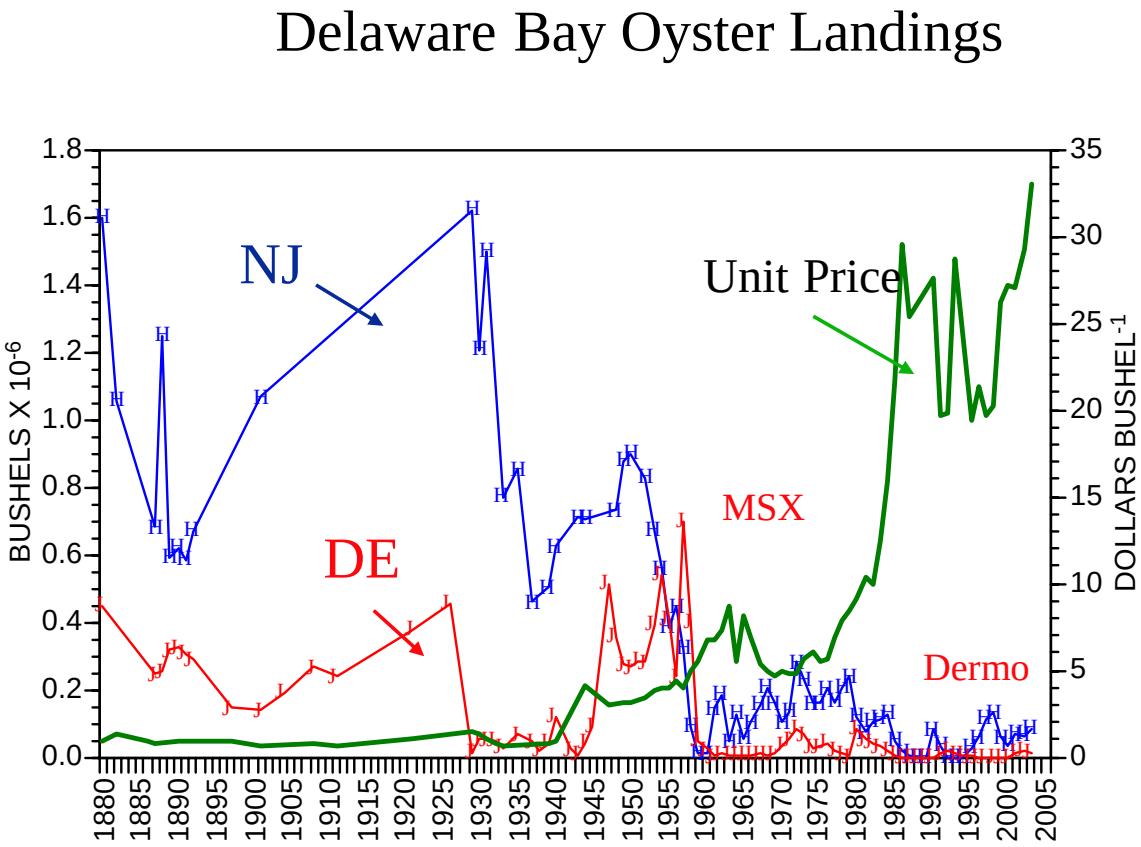

Figure 2. New Jersey (Blue) and Delaware oyster landings. Price per bushel is in green. The large drop in the middle 1950's and in 1985 is due to the oyster parasite MSX. The parasite Dermo became important in 1990.

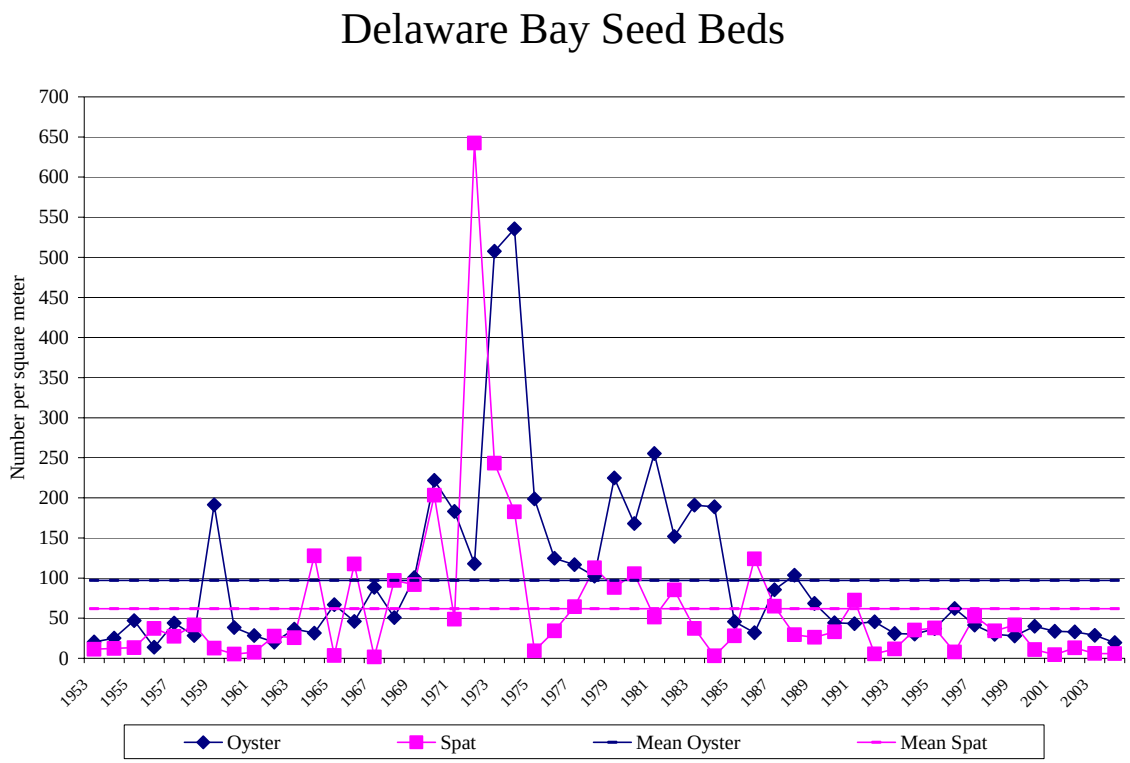

Figure 3. Annual abundance and long term average abundance of adult and young (spat) oysters on the New Jersey Delaware Bay seed beds from 1953 to 2004.

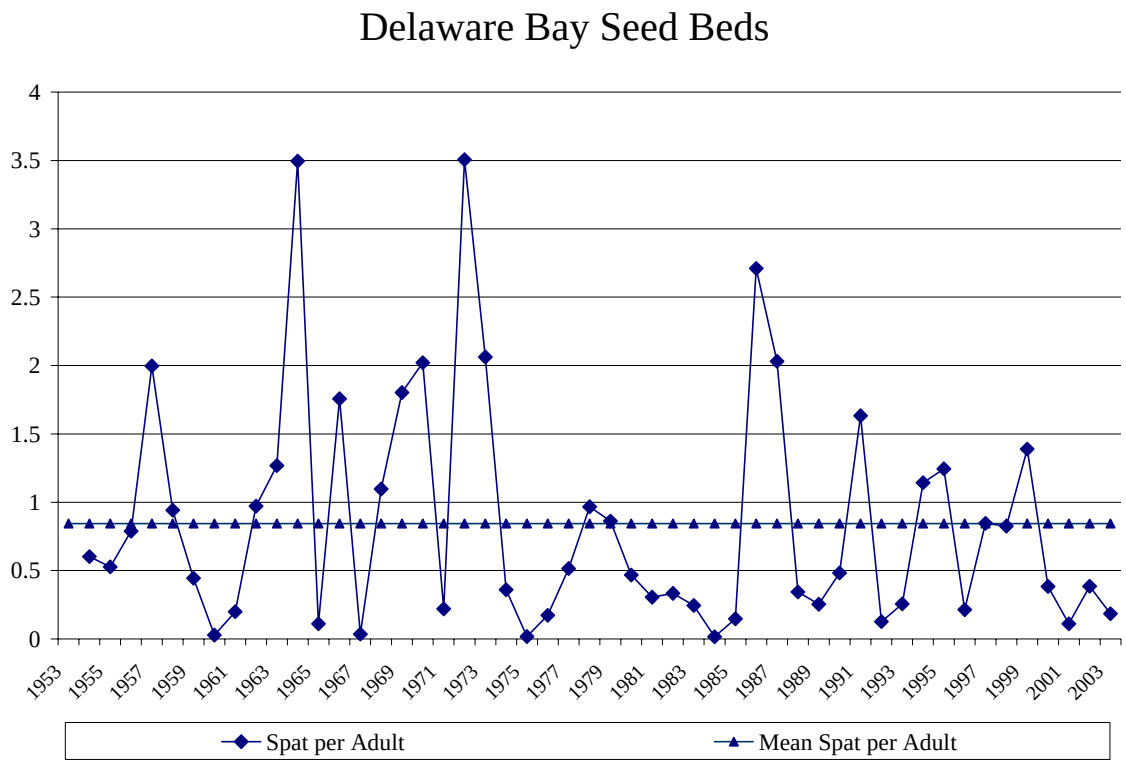

Figure 4. Annual average and long term average number of young oysters (spat) per adult oyster for the New Jersey Delaware Bay Seed Beds 1953 to 2004.

Enhance Natural Sets

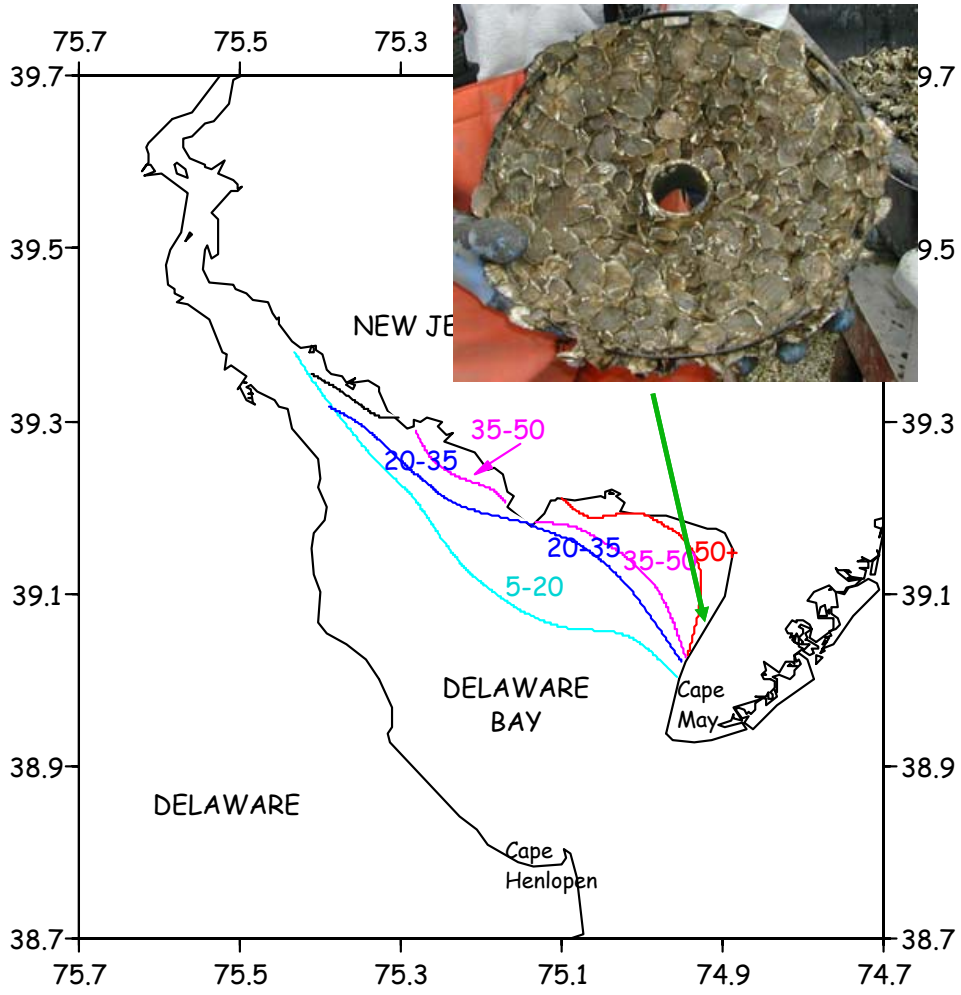

Figure 5. Percentage of years in which initial spat survival on the New Jersey side of Delaware Bay will be at least 20 spat per clean oyster shell surface. The insert is an oyster spat collector placed in the 50+ zone showing newly set spat. (Source, Dr. Susan Ford).